PART I - ADMINISTRATIVE

Section 1. General administrative information

Title of project

Assess Resident Fish Stocks Of The Owyhee Basin, D.V.I.R.

BPA project number: 20094
Contract renewal date (mm/yyyy): ☒ **Multiple actions?**

Business name of agency, institution or organization requesting funding
Shoshone-Paiute Tribes of the Duck Valley Indian Reservation

Business acronym (if appropriate) Sho-Pai Tribes - DVIR

Proposal contact person or principal investigator:

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NPPC Program Measure Number(s) which this project addresses
Section (§) 2.1A.1 ; §2.2A ; §2.2H; §7.1B; §7.1C; §10.1; §10.1A; §10.1E; §10.1E1; §10.2; §10.2A.2; §10.5; §10.5B; §10.5B1; §10.5B2; §10.8C.2

FWS/NMFS Biological Opinion Number(s) which this project addresses
USFWS status review of redband trout pursuant to ESA listing; FERC relicensing considerations of the Hells Canyon Complex relative to the 1999 FCRPS (Hydropower Operations) Biological Opinion, NMFS

Other planning document references
CBFWA-Resident Fish Managers (1997) Multi-Year Implementation Plan
Federal MOA on Bonneville Power Administration Fish & Wildlife restoration funding
Department of Energy / BPA Tribal Policy
State of Idaho and State of Nevada Fish Management Plans affecting the Owyhee Basin
Independent Scientific Group (1996) Return to the River / (1997) Review of Columbia Basin Fish and Wildlife Program
NPPC Regional Multi-Species Framework Project/Process/Documents

Short description
Conduct a systematic resident fish species inventory & stock assessment in the Owyhee River Basin, DVIR component. Design a sampling strategy and protocol to evaluate the genetic composition / introgression of native trout populations on the DVIR.

Target species
Native redband trout and bull trout; introduced trout species (e.g., rainbow, cutthroat, brook); other resident resident species comprising the native community.

Section 2. Sorting and evaluation

Subbasin
Owyhee

Evaluation Process Sort

CBFWA caucus	Special evaluation process	ISRP project type
Mark one or more caucus	If your project fits either of these processes, mark one or both	Mark one or more categories
☐ Anadromous fish ☒ Resident fish ☐ Wildlife	☐ Multi-year (milestone-based evaluation) ☐ Watershed project evaluation	☐ Watershed councils/model watersheds ☐ Information dissemination ☐ Operation & maintenance ☐ New construction ☒ Research & monitoring ☒ Implementation & management ☐ Wildlife habitat acquisitions

Section 3. Relationships to other Bonneville projects

Umbrella / sub-proposal relationships. List umbrella project first.

Project #	Project title/description
20536	Develop Management Plan & Assess Fish & Wildlife Of The Owyhee Basin, DVIR
20040	Develop a Fish & Wildlife Management Plan for the Owyhee Basin, DVIR
20041	Develop a Fish & Wildlife Conservation Law Enforcement Plan, DVIR
20094	Fish Assess Resident Fish Stocks Of The Owyhee Basin, DVIR
9701100	Enhance and Protect Habitat and Riparian Areas on DVIR
	Implement Fishery Stocking Program Consistent with Native Fish Conservation
20092	Inventory Wildlife Species & Populations Of The Owyhee Basin, DVIR
20093	Evaluate the Feasibility for Anadromous Fish Reintroduction in the Owyhee

Other dependent or critically-related projects

Project #	Project title/description	Nature of relationship
9701100	Enhance and Protect Habitat & Riparian Areas on the Duck Valley Indian Res	Habitat enhancement is a critical need for comprehensive fish & wildlife management of the Owyhee Basin DVIR
9501500	Lake Billy Shaw Wetlands Catch & Release Fishery O&M	A new BPA- funded reservoir was completed in 1998 on the DVIR -- the development of its fisheries needs to be integrated within a comprehensive fish management plan.
8815600	Stocking Fish in Lakes and Streams on the Duck Valley Indian Reservation	Stocking of hatchey trout in reservoirs and streams has been implemented for many years to provide fisheries and economic benefits to the DVIR -- this program needs to be re-evaluated & integrated in the rationale of a comprehensive fish management plan.
9500600	Shoshone-Bannock/Shoshone-Paiute Joint Culture Facility	A BPA-funded fish culture facility is being developed to provide trout production to supplement fisheries on Duck Valley and Fort Hall reservations. Its operation should be coordinated with the comprehensive Owyhee Basin resident fish management plan.

Section 4. Objectives, tasks and schedules

Past accomplishments

Year	Accomplishment	Met biological objectives?
	New Project -- Not Applicable	

Objectives and tasks

Obj 1,2,3	Objective	Task a,b,c	Task
1	Conduct a resident fish population assessment of the DVIR component of the Owyhee River Basin.	a	Consult with fisheries scientist and/or hire project leader to design and implement the Owyhee Basin fish stock assessment study. (Year 1)
		b	Coordinate with relevant co-management entities (state, federal, and tribal), conduct a literature review, and compile all available data on fish distribution, abundance and ecological relationships in the Owyhee River Basin. (Year 1)
		c	Develop statistically valid field sampling methods, protocol and sampling design for the resident fish population assessment. (Year 1)
		d	Procure any additional equipment and supplies needed to implement the fish stock assessment. (Year 1)
		e	Implement the Owyhee Basin resident fish stock assessment based on the study design developed in Task 1c. (Years 2-3)
		f	Document findings in annual reports and provide input to the Owyhee Basin-DVIR strategic fish & wildlife management plan. (Years 1-4)
2	Conduct an evaluation of the genetic composition of native resident fish populations of the Owyhee River Basin with consideration to possible genetic introgression of introduced hatchery fish stocks.	a	Consult with a geneticist (e.g., Dr. Fred Allendorf, University of Montana) and/or scientists from cooperating entities (tribal, state & federal fish & wildlife agencies) on the study design to determine the genetic composition. (Year 1)
		b	Develop statistically valid methods, protocol and sampling design for a genetic composition assessment of resident salmonids in the Owyhee River System. (Year 1)
		c	Collect tissue samples from a sub-sample of wild trout collected from the fish stock assessment work (Objective 1) – based on the design developed in Task 2a. (Years 2-3)

		d	Submit the samples to a qualified genetics laboratory (e.g., University of Montana) for appropriate electrophoretic and/or DNA analyses. (Years 2-3)
		e	Document the results of the genetic composition evaluation in the final report and relate to other aspects of the stock assessment study. (Year 4)
3	Develop a GIS mapping capability for analysis and summary of population distribution and abundance of resident fish & wildlife stocks in the Owyhee Basin with a focus on the DVIR component.	a	Consult with a GIS expert and cooperating entities (tribal, state & federal fish & wildlife agencies) on the development of a PC-based GIS mapping system. (Year 1)
		b	Procure computer equipment, software and/or services needed to conduct GIS mapping of fish distribution within the Owyhee River Basin. (Year 1)
		c	Hire staff and/or obtain necessary training and/or services from cooperative entity to enable GIS mapping of fish distribution within the Owyhee River Basin. (Year 1)
		d	Implement GIS mapping of fish distribution within the Owyhee River Basin. (Years 2-4)
4	Develop a baseline to monitor and evaluate the status of resident fish stocks on the DVIR component of the Owyhee Basin.	a	Document the current resident fish species composition, distribution and abundance within the Owyhee River Basin – with emphasis on the streams and reservoirs of the DVIR. (Years 1-4)
		b	Relate the current resident fish species composition, distribution and abundance within the Owyhee River Basin to existing habitat and watershed conditions. (Year 4)
		c	Document the current genetic composition of resident fish within the Owyhee River Basin – with consideration to possible introgression with introduced species. (Years 2-4)

		d	Develop computer databases for fish stock assessment variables, genetic composition, and habitat conditions -- as a basis for evaluation of future long-term trends. (Years 1-4)
		e	Utilize the information on fish stock assessment to provide a rationale for restoration project implementation within the context of a comprehensive fish & wildlife management framework. (Year 2-4)

Objective schedules and costs

Obj #	Start date mm/yyyy	End date mm/yyyy	Measureable biological objective(s)	Milestone	FY2000 Cost %
1	01/2000	12/2003			50.00%
2	01/2000	12/2003			25.00%
3	01/2000	12/2003			15.00%
4	1/2000	12/2003			10.00%
				Total	100.00%

Schedule constraints
Sampling permits may be required. Possible ESA constraints (e.g., Section 10 permit) if bull trout are present. (note, although data are limited, bull trout are not known to be present on the DVIR).

Completion date
2003

Section 5. Budget

FY99 project budget (BPA obligated): $0

FY2000 budget by line item

Item	Note	% of total	FY2000
Personnel	1 FTE Project Leader ; 1.5 FTE field technicians	%40	89,000
Fringe benefits	@30%	%12	26,700
Supplies, materials, non-expendable property	fish sampling equipment; GIS computer system	%12	25,500
Operations & maintenance	1 vehicle lease + mileage	%4	8,500

Capital acquisitions or improvements (e.g. land, buildings, major equip.)		%0	
NEPA costs		%0	
Construction-related support		%0	
PIT tags	# of tags:	%0	
Travel		%1	2,400
Indirect costs	@26.6%	%18	40,459
Subcontractor	a) fish sampling methods, design & statistical analysis; b) genetic sampling protocol; c) GIS	%13	28,240
Other		%0	
TOTAL BPA FY2000 BUDGET REQUEST			$220,799

Cost sharing

Organization	Item or service provided	% total project cost (incl. BPA)	Amount ($)
	None identified at present	%0	
	(we will seek opportunitiies for cooperative studies / cost share in subsequent years)	%0	
		%0	
		%0	
Total project cost (including BPA portion)			$220,799

Outyear costs

	FY2001	FY02	FY03	FY04
Total budget	$245,799	$252,143	$105,000	

Section 6. References

Watershed?	Reference
☐	see umbrella proposal (ShopaiGD1.doc)
☐	
☐	
☐	

PART II - NARRATIVE

Section 7. Abstract

A significant component of the Owyhee River Basin is within the Duck Valley Indian Reservation (DVIR) -- which encompasses about 284,000 acres in Idaho & Nevada. Prior to the construction of the Hells Canyon complex (1958-67), the native fish assemblage of the Owyhee Basin included both anadromous and resident fishes. Owyhee Basin fish populations now consist of native resident species (e.g, redband trout & bull trout) and introduced stocks (e.g., rainbow trout & brook trout). A portion of the Owyhee Basin's fish population has been surveyed by various fishery entities (e.g., Idaho, Nevada, and BLM), but the DVIR component has not been assessed. The ISRP (1998) recommended that the Council require a systematic inventory of all resident fishes in the Columbia basin – citing Section 10.2 of the Program. Our proposed work is specifically called for in sections 10.1E1, 10.2A1, 10.2A.2, 10.5B.2, & 10.8C.2. The goal of this study is to conduct a systematic stock assessment of the resident fish populations of the DVIR in relation to the entire Owyhee River system. The objectives include evaluation of resident fish stocks in terms of: (a) distribution & relative abundance, and (b) genetic composition. The general approach will consist of three phases:

- Phase 1. Develop statistically sound methods, protocol and sampling design.
- Phase 2. Conduct field sampling, submit fish tissue samples to a genetics lab, and develop a data base.
- Phase 3. Fish stock assessment, GIS mapping of fish stocks in the Owyhee Basin, genetic analyses, and report preparation.

Section 8. Project description

a. Technical and/or scientific background

An overall description of *technical and scientific background* for comprehensive fish & wildlife enhancement on the Duck Valley Indian Reservation is provided in the "umbrella" proposal form – ShopaiGD1.doc. The additional specific information relating to this resident fish stock assessment sub-proposal follows.

The entire Owyhee Basin – encompassing the Duck Valley Indian Reservation (DVIR) -- is classified as a "*Blocked Area*" in the NPPC Fish and Wildlife Program (NPPC 1995; Section 10.8). The Owyhee Basin is in the upper Snake River Basin -- upstream from the Hells Canyon Complex that has completely blocked anadromous fish migrations for over 40 years (Hells Canyon Dam 1967; Oxbow Dam 1961; Brownlee Dam 1958). Prior to hydropower development the Owyhee Basin supported a large diverse community of native anadromous and resident fish populations. The complete extirpation of anadromous fish stocks from this area reduced the native salmonid species assemblage and greatly impacted the culture, religion and livelihood of the Shoshone and Paiute tribes that were dependent upon the once abundant anadromous fish resource. Resident fish and wildlife species in the subbasin were also impacted through lost productivity

(absence of nutrient component attributable to anadromous fish) and habitat degradation relating to land-use practices (agriculture, grazing, logging, mining and municipal development) facilitated by hydropower development in the region.

Owyhee River Basin fish populations now consist of both native resident species (e.g, redband trout & bull trout) and stocks of hatchery reared salmonids (e.g., rainbow trout, Lahontan cutthroat trout and brook trout) that were introduced since the early 1980's to provide fishing opportunities (IDFG 1996; Burge and Miller 1993). The off-reservation portion of the Owyhee Basin's fish population has been surveyed by various fishery entities (e.g., IDFW, NDOW, and BLM). It is known that native populations of redband trout live in waters adjacent to the DVIR (B. Zoellick, 1997 personal communication). Limited sampling has been conducted on the DVIR component of the Owyhee Basin in recent years in conjunction with habitat enhancement work (V. Pero, Shoshone-Paiute Tribes, personal communication) however, it has not been assessed in a systematic manner. The ISRP (1997) recommended that the Northwest Power Planning Council Council require a systematic inventory of all resident fish populations in the Columbia basin – citing Section 10.2 of the Fish & Wildlife Program. The ISRP stated that these population assessments are needed so that restoration opportunities for resident fish can be identified and prioritized.

The goal of this study is to conduct a systematic stock assessment of the resident fish populations of the DVIR in relation to the entire Owyhee River system. The objectives include evaluation of resident fish stocks in terms of: (a) distribution & relative abundance, and (b) genetic composition. This study will develop a standardized methodology, protocol and a statistically sound sampling design to systematically assess the species composition, distribution and relative abundance of resident fishes in the Owyhee River Basin. Standardized sampling methods and strict sampling protocols are required to reduce variation among samples and to detect changes in relative abundance (Fisheries Techniques Standardization Committee 1992). Several sampling methods will be considered and utilized (e.g., electrofishing, hook-and-line angling, skorkel surveys, and nets) in order to adequately sample all resident fish species comprising the community. Special consideration will be given to non-lethal methods, and stratified times and locations – for representative samples of salmonid populations – in order to achieve a valid assessment of current baseline species composition and population abundance. This statistically valid baseline will be a prerequisite for subsequent monitoring of population trends – derived from the standardized sampling conducted in subsequent years. The methods developed and refined in this study may also be a basis for similar surveys in other tributary subbasins of the Columbia River.

The value of stream surveys for monitoring and evaluation purposes is dependent upon a statistically valid sampling design. A sampling design based on stratified random sampling generally allows unbiased estimates of fish species composition, temporal and spatial distribution, and relative abundance. A rigorous sampling plan also allows for explicit identification of assumptions, developing a-priori hypotheses, and testing hypotheses in the context of a statistical model. A stratified sampling design can reduce the overall variance of various statistical estimates and increase the precision of estimated

population parameters. Initial surveys can be utilized to estimate sample sizes needed to detect statistically significant differences in key population variables and subsequently for valid determination of long term population trends.

The Council's Fish & Wildlife Program recognizes the importance of biodiversity of both anadromous fish (§ 7.1) and resident fish (§ 10.2B) – to protect the integrity and sustainability of ecosystems comprising the Columbia Basin. The current status of population structure and genetic composition native fish in the Columbia Basin has not been scientifically documented and therefore is not well understood. We are proposing to develop a protocol for sub-sampling and cyropreservation of fish captured in the stock assessment study for subsequent extraction of tissue samples required for genetic analysis. We plan to contract with scientists from an established genetics laboratory with experience in genetic analysis of salmonid species (e.g., University of Montana) to help design a sampling protocol and to conduct the genetic testing (e.g., electrophoresis and DNA analysis). The objectives of the genetic testing would be to: (a) determine the genetic composition and identity of native populations of redband trout (and bull trout if present); and, (b) to estimate the amount of genetic introgression present in wild populations derived from introduced stocks (e.g., hatchery-derived rainbow trout). This study will provide valuable baseline information on the genetic diversity of resident fish populations in a remote and relatively pristine portion of the Columbia River Basin, i.e., the Owyhee River system. Thus the proposed work can make significant contributions to the knowledge of the biodiversity and the genetic diversity of resident fishes in the Columbia Basin.

The general approach of the proposed study consists of three phases:

- **Phase 1**. Develop statistically sound methods, protocol and sampling design for both fish population assessment and genetic diversity evaluation. Retain personnel (qualified staff and contract scientists), and procure needed computer and field sampling equipment. Take preliminary samples for refinement of methods and overall study design. Document findings in an annual report and provide input to the Owyhee Basin-DVIR strategic fish & wildlife management plan. {Year 1}.
- **Phase 2**. Implement field sampling, submit fish tissue samples to a selected genetics laboratory, collect data in a systematic electronic based format, and develop a stock assessment computer data base. Document findings in annual reports and provide input to the Owyhee Basin-DVIR strategic fish & wildlife management plan. {Years 2 and 3}.
- **Phase 3**. Conduct statistical data analysis, evaluate resident fish population parameters, develop GIS mapping of fish stocks in the Owyhee Basin, determine fish genetic composition and stock inter-relationships, and document findings in annual and final reports. Transfer results of resident fish stock assessment and genetic diversity to project implementation within the overall management plan for the Owyhee Basin, DVIR component {Year 4}.

b. Rationale and significance to Regional Programs

An overall description of *rationale and significance to regional programs* is provided in the "umbrella" proposal form – ShopaiGD1.doc. The proposed resident fish stock assessment work by the Shoshone-Paiute Tribes is called for in sections 10.1E1, 10.2A1, 10.2A.2, 10.5B.2, & 10.8C.2 of the Councils Fish & Wildlife Program. In the review of the

Council's Fish & Wildlife Program, the Independent Scientific Review Panel (ISRP 1997; p 29) commented that measures in Section 10 outline a logical sequence beginning with an evaluation of the status of native resident fish populations. In reviewing FY1999 proposals, the ISRP (1998; p 96) specifically identified the need for an overall assessment of fish and biota in the Owyhee Basin. Brief summaries of the specific Council measures relating to directly to this resident fish stock assessment sub-proposal are presented below:

§ 2.1A1: Explore methods to assess trends in ecosystem health.
§ 2.2A: Support native species in native habitats.
§ 2.2H: The need to learn from implementation (monitoring & evaluation).
§ 7.1B: Conserve genetic diversity
§ 7.1C: Collection of population status, life history and other data on wild and naturally spawning populations.
§ 10.5B.2: In consultation with the Idaho Department of Fish and Game, Oregon Department of Fish and Wildlife, Shoshone-Bannock Tribes, Shoshone-Paiute Tribes and Burns Paiute Tribe, fund the initiation of a comprehensive genetic sampling program for native salmonids upstream of Hells Canyon Dam in the Snake River and its tributaries.
§ 10.1E1: Implementation of identified resident fish projects by 2006.
§10.2A1: Address resident fish as well as anadromous fish in developing a plan for genetic diversity as called for in measure 7.1.D.1.
§ 10.2A.2: Address potential impacts on resident fish, where such impacts exist, in developing basinwide guidelines to minimize genetic and ecological impacts of hatchery fish on wild and naturally spawning species as called for in measure 7.2A.1.
§ 10.5B.2: In consultation with the Idaho Department of Fish and Game, Oregon Department of Fish and Wildlife, Shoshone-Bannock Tribes, Shoshone-Paiute Tribes and Burns Paiute Tribe, fund the initiation of a comprehensive genetic sampling program for native salmonids upstream of Hells Canyon Dam in the Snake River and its tributaries.
§ 10.8C.2: Review Duck Valley Indian Reservation surface water and groundwater suitability for resident fish production facilities. Initiate a comprehensive genetic sampling program of the redband trout in Owyhee Basin. Based on results of these studies, develop and implement strategies to protect wild redband trout populations from potential impacts caused by hatchery programs.

c. Relationships to other projects

An overall description of *relationships to other projects* is provided in the "umbrella" proposal form – ShopaiGD1.doc. The following BPA-funded projects are ongoing during FY1999-2000 for resident fish mitigation and enhancement on the DVIR. Relationships of these ongoing projects with the proposed resident fish stock assessment sub-proposal are summarized in the following section.

Project 9701100 "Enhance and Protect Habitat & Riparian Areas on the Duck Valley Indian Reservation" [NPPC measure 10.8C.5] It is important to relate native fish population distribution and abundance and overall fish community structure -- with our ongoing study of existing habitat conditions (springs, streams, and reservoirs) and the overall Owyhee River watershed assessment.

Project 9501500 "Lake Billy Shaw Wetlands Catch & Release Fishery O&M" [NPPC measure 10.8C; 10.8C4] A new BPA-funded dam was completed in 1998 on the DVIR and Lake Billy Shaw will begin filling in 1999 -- the development of its fisheries needs to be integrated within a comprehensive fish management plan that gives consideration to genetic diversity of native fish populations and overall biodiversity of the ecosystem.

Project 8815600 "Stocking Fish in Lakes and Streams on the Duck Valley Indian Reservation" [NPPC measure 10.8C1; 10.8C3] Trout stocking in reservoirs and streams on the DVIR has been ongoing since 1988 and is required to provide mitigation for lost fish production and harvest for Tribal sustenance and income. We need to balance the needs for fishing opportunities for Tribal members and economic development on the DVIR -- with maintenance of genetic diversity of native fish stocks.

Project 9500600 "Shoshone-Bannock/Shoshone-Paiute Joint Culture Facility" [NPPC measure 10.8C3; 10.8C6] A BPA-funded fish culture facility is being developed to provide trout production to supplement fisheries on Duck Valley and Fort Hall reservations. Its operation should be coordinated with the comprehensive Owyhee Basin resident fish management plan -- including Lake Billy Shaw fishery development and conservation of genetic diversity of native trout populations.

d. Project history (for ongoing projects)

New Project – Not Applicable

e. Proposal objectives

The overall goal of the Shoshone-Paiute "umbrella project" (refer to ShopaiGD1.doc) is to coordinate a comprehensive Fish, Wildlife and Habitat Restoration Plan for the Duck Valley Indian Reservation -- including fish & wildlife management planning, fish stock assessment, and wildlife inventory of the Owyhee Basin, DVIR component. The specific objectives of this sub-proposal follow.

- **Objective 1**. Conduct a resident fish population assessment of the DVIR component of the Owyhee River Basin.

- **Objective 2**. Conduct an evaluation of the genetic composition of native resident fish populations of the Owyhee River Basin with consideration to possible genetic introgression of introduced hatchery fish stocks.

- **Objective 3**. Develop a GIS mapping capability for analysis and summary of population distribution and abundance of resident fish & wildlife stocks in the Owyhee Basin with a focus on the DVIR component.

- **Objective 4**. Develop a baseline to monitor and evaluate the status of resident fish stocks on the DVIR component of the Owyhee Basin with respect to (a) population

distribution and abundance, (b) genetic diversity, (c) habitat and watershed conditions, (d) long-term trends, and (e) rationale for restoration project implementation within the context of a comprehensive fish & wildlife management framework.

f. Methods

The overall strategic planning and adaptive program management for an integrated suite of fish and wildlife enhancement projects on the Duck Valley Indian Reservation (DVIR) are described in the "umbrella project" (refer to ShopaiGD1.doc). It will incorporate two related approaches to achieve an integrated fish & wildlife management plan and project implementation based on scientific principles.

- First, develop an internally consistent and comprehensive Shoshone-Paiute strategic plan for the restoration of fish, wildlife, and watershed resources on the Duck Valley Indian Reservation.
- Second, coordinate with state, regional, and federal planning processes (e.g., Idaho & Nevada fish management plans, NPPC Fish & Wildlife Program, Multi-Species Framework, ESA recovery plans, etc.) to develop a management framework that maximizes opportunities cooperative efforts and successful restoration of the Owyhee ecosystem.

A monitoring and evaluation (M&E) plan will be an integral part of the DVIR fish & wildlife framework and M&E will be incorporated into individual projects. **The specific methods employed in the resident fish stock assessment sub-proposal are described in the following section.**

- **Objective 1**. Conduct a resident fish population assessment of the DVIR component of the Owyhee River Basin.

In the initial year we will hire a fisheries biologist and retain consultants (fisheries samling design and GS experts) to assist in the final design and implementation of the Owyhee Basin Stock Assessment Project. Likewise, we will procure any additional equipment and supplies needed to implement the fish stock assessment studies.

We will meet with relevant co-management entities (Idaho, Nevada, BLM, Shoshone-Bannock and Burns Paiute, and other tribes as needed) to obtain all relevant information on upper Snake River resident fish population status. We will conduct a literature review, and compile all available data on fish distribution, abundance, ecological relationships, and genetic composition of fish species in the Owyhee River Basin. The primary product in FY2000 will be the development of a statistically valid field sampling methods, protocol and sampling design for the resident fish population assessment and genetic diversity study (refer to Objective 2) -- in conjunction with the overall management plan (refer to the umbrella proposal (ShopaiGD2.doc).

In the second and third years of the study, we will initiate the field sampling of Owyhee Basin resident fish populations, based on the study design. Each year, we will document findings in annual reports and provide input to the Owyhee Basin-DVIR strategic fish & wildlife management plan.

- **Objective 2**. Conduct an evaluation of the genetic composition of native resident fish populations of the Owyhee River Basin with consideration to possible genetic introgression of introduced hatchery fish stocks.

In the initial year of the study, we will consult with an experienced geneticist (e.g., Dr. Fred Allendorf, University of Montana) and/or scientists from cooperating entities (tribal, state & federal fish & wildlife agencies) on the study design to determine the genetic composition of native resident salmonids in the Owyhee Basin. Subsequently, we will develop statistically valid methods, protocol and sampling design for a genetic composition assessment of resident salmonids in the Owyhee River System.

Starting in the second year, we will collect tissue samples from a sub-sample of wild trout collected from the fish stock assessment work (Objective 1). We plan to submit the samples to a qualified genetics laboratory (e.g., University of Montana) on a regular schedule during the field season for appropriate electrophoretic and/or DNA analyses. The results derived from the genetic composition evaluation will be documented in the final report and will be related to other aspects of the stock assessment study.

- **Objective 3**. Develop a GIS mapping capability for analysis and summary of population distribution and abundance of resident fish & wildlife stocks in the Owyhee Basin with a focus on the DVIR component.

During the initial year we will consult with GIS experts and cooperating entities (tribal, state & federal fish & wildlife agencies) on the development of a PC-based GIS mapping system. We anticipate that experience derived from other BPA-funded studies -- such as the Kalispel Tribes'GIS-based fish stock assessment study – will be very valuable for facilitation of our work. We also plan to procure computer equipment software and/or services needed to conduct GIS mapping of fish distribution within the Owyhee River Basin during the initial year. We will investigate possibilities for cooperative arrangements and cost sharing; for example, GIS-related services may be available from a cooperative entity to enable GIS mapping of fish distribution within the Owyhee River Basin. During the second and third years we plan to implement GIS mapping of fish distribution data derived from the stock assessment work described in Objective 1. We may also be able to overlay information on current genetic composition of fish stocks (Objective 2) and past stocking of hatchery trout throughout the Owyhee River Basin.

- **Objective 4**. Develop a baseline to monitor and evaluate the status of resident fish stocks on the DVIR component of the Owyhee Basin with respect to (a) population

distribution and abundance, (b) genetic diversity, (c) habitat and watershed conditions, (d) long-term trends, and (e) rationale for restoration project implementation within the context of a comprehensive fish & wildlife management framework.

During the fourth year of the study (2003), we will document our findings on the current resident fish species composition, distribution and abundance within the Owyhee River Basin – with emphasis on the streams and reservoirs of the DVIR. We will also relate the stock assessment data to concurrent habitat conditions derived from the companion water quality / watershed restoration study (BPA Project 9701100). We will evaluate the current genetic composition of resident salmonid populations within the Owyhee River Basin – with consideration to possible introgression with exotic trout stocks derived from hatchery introductions. We will develop computer databases for fish stock assessment variables, genetic composition, and habitat conditions -- as a basis for evaluation of future long-term trends.

Ultimately, we will use the results of the resident fish stock assessment study for adaptive management of the overall DVIR fish and wildlife program within the structure of our strategic fish management plan (refer to the umbrella project). The rigorous stock assessment design developed by this proposed project would lay the foundation for long-term assessment of fish species and stocks in the Owyhee Basin. Statistical analysis of long-term temporal trends in data derived from concurrent fish stock assessment and habitat monitoring will facilitate quantitative assessment of ecological impacts and biological benefits of project actions. We can also utilize the information on resident fish species composition, distribution, abundance and genetic composition, and ecological relationships to provide a scientifically-based rationale for decisions on future restoration project implementation in the Owyhee Basin -- within the context of a comprehensive regional fish & wildlife management framework.

g. Facilities and equipment

Refer to the "umbrella project" (ShopaiGD1.doc) for a description of *facilities and equipment*.

h. Budget

This proposal is designed sub-proposal under the Shoshone-Paiute "umbrella project" for BPA-funded fish & wildlife implementation projects on the Duck Valley Indian Reservation – therefore oversight by the Fish, wildlife and Parks Director is covered by the umbrella project (ShopaiGD1.doc) and not included here. The personnel category is for a full time Project Leader (MS-level) and three part time fishery technicians.

Fish sampling equipment, field supplies, and computer hardware & software costs are estimated at $25,500 for the first year.

The O&M category includes a 4-wheel drive vehicle lease from GSA.

Fringe benefits are based on a 30% rate.

The Travel category includes $2,400 for travel expenses of the Project Leader for attending meetings and to facilitate regional coordination.

The Indirect Costs of $40,459 are based on 26.6% of the subtotal categories – excluding catitol equipment and subcontracting services.

The subcontractor category is for fishery sampling design, genetics and GIS consulting services needed for the development of a valid statistical sampling design and genetic tissue sample collection & storage protocol. A scientifically valid sampling design is needed for the rigorous stock assessment & genetic diversity study and for the formulation of a long-term monitoring and evaluation plan for fish stock trends. The cost of these services for the stcok assessment is estimated at $28,240 per year; this does not include consulting services for the overall project covered under the umbrella project budget.

Section 9. Key personnel

Refer to the "umbrella project" (ShopaiGD1.doc) for a resumes of *key personnel*. The following Sho-Pai staff and consultants will be implementing this specific sub-proposal:

Section 10. Information/technology transfer

Refer to the "umbrella project" (ShopaiGD1.doc) for a description of proposed *information and technology transfer* media and methods.

Congratulations!